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PACIFIC COAST GAS ASSOCIATION[1]

PRESIDENT'S ADDRESS

As president of the Pacific Coast Gas Association it is my pleasant duty to welcome you to our 18th annual meeting, and as a resident of Los Angeles I heartily welcome you to this city. Those of you who have not visited Los Angeles for some time will doubtless see a great change in the city. We have grown with rapid strides in the past few years, in fact to such an extent that it has been difficult for the public service corporations to keep pace with the city. But we who have watched the city grow and helped to make it what it is, feel proud of what has been accomplished, and we bid you a hearty welcome with the hope that your stay here will be both pleasant and profitable.

W. B. CLINE
President Pacific Coast Gas Association

During the past year the gas industry on the Pacific Coast has shown a steady and healthy growth which bids fair to continue. Many difficulties have been met and overcome but many problems still confront us. We have endeavored to select the ones of most vital interest as topics to be dealt with in detail by the papers to be read, but there are a few matters which I wish to briefly review for your consideration. For better presentation I have divided these matters into the general subjects of "Manufacture," "Distribution," "Legislation," "Labor Conditions," and "Miscellaneous."

Manufacture.

The development of extensive oil fields and the lack of any large coal beds, have made the question of producing gas from oil one of absorbing interest to gas men on this coast. Up to the present time one process of oil gas manufacture, with slight variations, has been generally adopted. This has long since passed the experimental stage and reached the point where we can take up the refinements of plant economy. We have proved our ability to regulate the heat units and candle power and our principal efforts are now bent toward greater oil efficiency and generator capacity. I presume our ultimate aim, although we may not reach it for many years, should be a continuous process and one which would gasify all the oil, thus leaving nothing but gas to be handled by the companies.

Under the present method we are still confronted with the problem of the handling and disposition of carbon or lamp-black. Recently experiments have been made with a filter similar to that commonly used in filtering ore slimes in mines, the idea being to re-

[1] 18th Annual Meeting. Los Angeles California, September 20-23, 1910.

move most of the water from the carbon with this filter as it comes direct from the generators, then to pass the carbon through a mechanical drier, when it would be ready to briquet or use otherwise. If this proves successful it will avoid the necessity of having large drying pits and large cranes or other handling apparatus.

The question of the most economical use of carbon is one which presents itself differently in each individual case. The Los Angeles Gas and Electric Corporation has found it pays best to briquet it and retail it for household use. I believe that in most cases if this fuel is properly placed before the public it will find a ready market at a price that will net the company greater returns than will any other use. It is undoubtedly one of the best solid fuels that can be obtained.

One question which always has our attention and which is probably watched with the keenest interest, is the matter of oil supply. Recent oil developments have been quite successful, especially in the Kern field, one gusher brought in said to be producing more oil than had theretofore been produced by the whole field. Up to the present time, however, the oil companies seem to be the only ones benefited, as they have combined to shut down a number of their wells and are storing large quantities of oil, so that the price has shown little decline.

My attention has been called to a piece of apparatus lately developed, which is causing considerable discussion among electric men, and which may prove useful in the operation of gas works; that is the low pressure turbine. This provides the most economical use thus far discovered for exhaust steam. Turbines are coming into quite general use for driving auxiliary apparatus at both gas and electric stations, and seem to be particularly well adapted to high speed machines.

Distribution.

The system of high pressure distribution, especially distribution through high pressure feeder mains to low pressure laterals by means of street-main governors, is everywhere growing in favor, and its advantages in the way of better pressure control, ease in handling variations of output, and decreased original cost are being generally recognized. This system was first introduced and developed in America, but since it has been demonstrated that compression does not seriously affect the quality of the gas, other countries are fast taking it up.

In this rapidly growing western section of the country, this system seems to have been adopted as the only means of keeping pace with the increasing demand. Where cities and towns are growing and spreading so rapidly and where sections of country which one year are sparsely settled farming districts are the next year thriving villages, it becomes necessary to have some system of distribution which can readily be changed to fit any condition, and this system seems to serve the purpose better than any other yet devised.

It has been found, too, that gas can with economy be distributed at much greater distances from the works than was deemed advisable a short time ago, thus enabling small communities to obtain a supply at a reasonable price where it has heretofore been practically impossible. In the larger cities the companies are extending high pressure lines to supply the suburbs and outlying districts, and the smaller towns are combining with one central works feeding several small cities.

Throughout the east there has been considerable experimenting and discussion over the problem of oiling meters. There was a very interesting paper on this subject read at the last meeting of the Illinois Gas Association. It is possible this matter might be taken up with profit by gas companies on this coast.

Legislation.

There has previously been brought before this Association the question of having a State Public Utilities Board appointed. This is a matter of the utmost importance to all public utility corporations and I would urge you to give it every possible aid. It has been demonstrated time and again that local men are not capable of fixing rates for public service corporations without prejudice. Corporation baiting has become too popular to be resisted by the petty politicians who usually have this matter in hand and the hearings are the most veritable farces. Moreover, under the present method, rates are reduced to ostensibly give what would be a fair rate on a perfectly safe investment, but at the same time we are offered absolutely no protection either from the municipal ownership craze or the devastations of "pirates." Several of the eastern states have already adopted the plan of regulating public service corporations by a State Commission, generally appointed by the Governor and composed of men from various parts of the State, thus putting the matter as far as possible in the hands of disinterested parties, and it seems to be proving a benefit to both the corporations and the community. A competent State Commission I believe would insure us fair rates and a much more settled condition as to competition, etc., thus enhancing the value of our securities.

In connection with rate-fixing, one point which has always been a matter of contention between municipalities and corporations is whether the "going value" shall be considered. By its decision in the case of the City of Omaha vs. the Omaha Water Company, the Supreme Court of the United States has apparently definitely decided that municipalities must consider this in their dealings with corporations. This was a case in which the city desired to purchase the water plant, and in deciding the case the court uses the following language, about which there certainly can be no doubt:

> "The option to purchase excluded any value on account of unexpired franchise; but it did not limit the value to the bare bones of the plant, its physical properties, such as its land, its machinery, its water-pipes or settling reservoirs nor to what it would take to reproduce each of its physical features. The value in equity and justice must include whatever is contributed by the fact of the connection of the items making a complete and operating plant. The *difference between a dead plant and a live one is a real value and is independent of any franchise to go on or any mere good will as between such a plant and its customers.*"

Another matter which was brought up at the last session of the California State Legislature, but which was afterward defeated at the polls, is the separation of State and local taxation. I hope this question will again be taken up with more successful results, for I believe a carefully framed amendment to our constitution would accomplish much in the way of a more equitable assessment of public service corporations than is now possible, and would avoid the continual wrangling with equalization boards and expensive lawsuits now necessary in a great many cases to obtain a fair property valuation.

There is still time now to get these matters before the next session of the Legislature and I hope the necessary steps will be taken to have them enacted.

Another care has been added during the past year to the already plentiful supply now worrying the corporation manager. A Federal tax of one per cent per annum has been imposed on the net income of all corporations, above $5000. No corporation will object to a reasonable license tax for the privilege of doing business as a corporation, but as our corporate charters come from the State, this law can be regarded only as a revenue tax, and it certainly seems an unjust discrimination that a corporation should be taxed on its income while individuals of equal wealth, and perhaps carrying on exactly the same business, contribute nothing. This matter is now in the courts and it seems as though it should be decided unconstitutional.

Labor Conditions.

There has been one drawback to an otherwise generally successful and prosperous year, and that is the strikes which have occurred, principally among the metal workers. There seems to be no reason for these strikes except a general discontent and desire to extend the domination of the unions. This is a matter which seriously affects the gas industry, not only because it means delay in construction work needed for the winter's load, work which many times cannot be put off without disastrous results, but also on account of the general hard times it brings to all industry. I hope the iron foundrymen will stand firm in their resistance to the demands of the union, and I believe that we as gas men should render them every assistance in suppressing the agitation. I believe that all employes should be accorded liberal treatment and given every opportunity to learn and advance themselves in their work, but one successful strike merely leads to another and one concession granted to organized labor merely means another demand, until they reach beyond all reason.

Miscellaneous.

The recent perfection of the tungsten electric light has given zest to the competition between electric and gas lighting, and there have been great improvements made in the incandescent gas lamp as well as in the electric light. It must be admitted that up to the present time, in economy and in the quality of the light given, the gas lamp has not been surpassed, and much has also been done in the way of making it as convenient as the electric light—a single chain on a fixture or a push button on the wall now taking the place of the match. The United Gas Improvement Company of Philadelphia has recently fitted up a large store in the heart of the business district, devoted entirely to handling gas appliances. A recent circular of theirs gives illustrations of some very neat and attractive fixtures which equal in every way the most modern electric fixtures. A notable demonstration of what can be done in gas lighting was also given by the National Commercial Gas Association at its exhibition in New York last December.

One thing that has hurt gas lighting considerably in the past has been the claim put forth by many that it was unhealthy, but it has recently been shown by eminent scientists that, especially in large halls, it is rather beneficial than otherwise.

The gas furnace and automatic water heater have recently been brought to a state of perfection which makes them commercial appliances and they are now potent factors in increasing the consumption per meter. There has also recently been placed upon the market a new gas laundry iron which I hope will supply a long felt want in the appliance line. Since ballooning has become such a fad the sales of gas for this purpose is quite a consideration in some places.

Last December a very serious and unusual accident happened in the collapse of a 7,000,000 foot holder in Hamburg, Germany. It is very improbable that such an accident could happen in this country, but it has had its effect upon the gas industry all over the world from the fact that the impression undoubtedly given the general public, who have not time to analyze such matters, is that all holders and all gas works are dangerous. As a matter of fact, however, this accident seems to have been caused by the very extraordinary custom adopted in some cases in Germany, of building annular holder tanks and leaving the space inside to be used for storing materials, etc. The iron roof of this store-room, upon which of course was exerted the pressure due to the weight of the lifts of the holder, was probably defective, allowing the gas to leak out through the chamber below to nearby generator fires.

Speaking of holders, I noticed in a recent issue of the London Journal of Gas Lighting a description of a holder tank with bulging sides. It is claimed for it that the strain is more evenly distributed, allowing much lighter plates to be used and consequently effecting a very material saving in cost. At first glance this seems a very peculiar method of construction, but as the one described, located at Simmering, Vienna, is apparently in successful operation and is of no small proportions, being a 5,300,000 cubic foot holder, it would seem that this question might be looked into with considerable profit.

The matter of rates charged for public utilities has been brought very forcibly to our attention recently by the increase in the prices of other necessities of life, especially the rise in the price of meat. We may well feel proud that rates for gas and electricity, on the contrary, have shown a steady decrease, and I hope that every effort will be made to continue this decrease in the future. The matter of revising rates cannot be gone over too frequently by the companies. In the larger cities where the rates are regulated by

municipal authorities there is little opportunity to charge more than a fair rate, but in the smaller cities where there is no interference of this kind the temptation is to put this matter off longer than is for the best interests of the companies. Such a policy causes hard feeling not only against the particular company but against public service corporations generally.

Before closing I want to take this opportunity to thank the officers for their valuable and untiring assistance during the past year. They have done excellent work for the benefit of the Association and are deserving of much praise.

I also want to call your attention to the Appliance Exhibition at No. 416 West Sixth street. Our Novelty Editor has succeeded in getting up a display which is a credit to the Association and I believe much benefit will be derived from it. I hope you will not fail to visit it.

Some excellent papers have been prepared for the meeting. The subjects chosen I believe will prove of the utmost interest to all of us and they have been ably handled. Our Wrinkle and Experience Editors have also been successful in getting together some very interesting and instructive data in their departments.

The thanks of the Association are certainly due to the four local gas corporations which have provided, in connection with the meeting, such generous entertainment for the members of the Association and their families.

COMBUSTION OF GAS CARBON OR LAMP BLACK.[1]

BY R. L. CLARKE.

One of the most aggravating positions for a gas engineer to be placed in is the accumulation of the by-products for which there is very little market and very little use about the plant. This has been the case for many years past in the manufacture of coal gas in which the by-products of coke, tar and ammonia were necessarily considered in the profits of the plant and derived entirely from the judicious sale of the same. The problems have been worked out by the coal gas companies by the introduction of water gas apparatus to consume the coke, the placing of tar burners under the coal benches and boilers to consume the tar, leaving only the ammonia as a by-product for commercial sale.

With the advent of the oil gas industry which originated on the Pacific Coast, a new by-product came up and is an important factor in the economical manufacture of gas, i. e., carbon recovered from the manufacture of gas from crude oil. The first plants manufacturing gas from crude oil considered this carbon a nuisance and expense, an entirely unwelcome visitor about a clean gas plant, but as the gas manufactured from crude oil increased and a larger number of gas plants adopted the system, it became generally understood that the carbon was at least good for fuel under the steam boiler. Later on its value was increased by being briquetted and sold to the public for fuel. Later this carbon was again increased in value by its use in water gas generators in place of coal or coke and in these generators it delivered a gas superior to the oil or water gas, even increasing the B.t.u. of the mixed oil and water gas. This is at present the height of economy in the use of this gas carbon but all gas plants are not equipped with the necessary water gas apparatus or the necessary carbon coke ovens with which to carry out this system and in fact most of the plants of the Pacific Coast are burning this carbon under their steam boilers at a great loss in efficiency compared with the use of the carbon in a water gas plant. In this connection this paper will be confined to the practical combustion of gas carbon under boilers as found in the ordinary gas plant, and will not enter to any extent, into the technical and chemical points in the combustion of this carbon.

It has been the custom in most gas plants to burn this carbon under boilers of the ordinary form on cast iron grates or on improved forms of wrought iron grate bars and also on water cooled grate bars. All of these methods either with natural or forced draught, have been tried out and have resulted in the destruction of the grate bars in a short time by the excessive heat. Each plant has its own individual plan of grate bars and system by which the carbon should be burned under the boilers. It is varied from the simple throwing in of the carbon on the grates, to an exacting method of coking the carbon on the front of the grates and then distributing over the surface of the grate bars, after the carbon becomes incandescent. There has also been some economy gained by the introduction of an oil or tar burner above this layer of carbon burning on the grates. This method of burning carbon is absolutely wrong and in opposition to all the correct principals of combustion. It is impossible to bring a fire up to the point of incandescence and then by throwing on top of it a blanket of wet carbon, expect to get proper combustion or efficiency from the fuel consumed. It is radically wrong, even to the extent in which it is carried out in a water gas plant, where the carbon is burned down by several runs of the generator to place several feet of wet carbon on top of an incandescent fire. It is like handing the company a gold brick.

With this opinion in view, I have tried to design a furnace in which the principals of combustion of not alone gas carbon but coal and coke, can be carried out with more economical results. In the case of coal and coke the resultant ash and clinkers are a factor to be considered, which in the furnace I refer to has not been considered, as the presence of ash and clinker in gas carbon is so small that this point can be overlooked to a great extent.

The first attempts to properly burn the gas carbon were made by the use of one of the under-feed stokers, commonly used in connection with the burning of coal. The results obtained were so encouraging that it led to further experiments and resulted in the designing of a gas carbon furnace similar to a dutch oven. The ordinary efficiency obtained from the burning of gas carbon on grates, either with forced or natural draught, was not over two pounds of water evaporated per pound of carbon and the boilers could

[1] Paper read at 18th Annual Convention Pacific Coast Gas Association.

not possibly be worked up to their capacity with this system of burning the carbon. By the use of the under-feed stoker, the efficiency was increased to four pounds of water evaporated per pound of carbon and the boilers were worked up to their capacity without the least trouble.

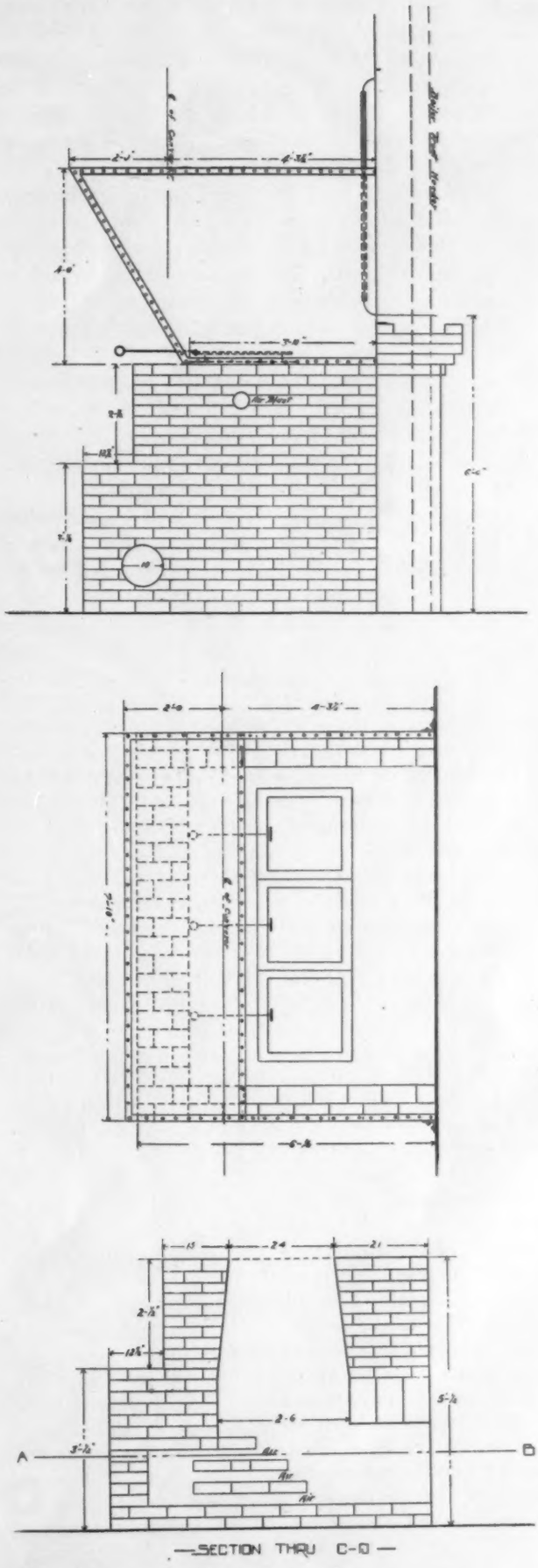
Encouraged by this result, a furnace was designed and erected similar to a dutch oven, such as is used by a great many in the burning of saw-dust, only the operation of the furnace is reversed.

By reference to the illustration it will be noticed that this furnace is designed on the lines of a base burner coal stove. The main apartment of the furnace containing the carbon, is rectangular and cone shape, being several inches wider at the bottom than at the top where the doors for the admission of the carbon are placed. This is designed to facilitate the

Gas Carbon Furnace

feeding of the carbon which is burned away at the bottom of the furnace. Experience with this furnace has shown that if the walls are perpendicular, the carbon will "hang up" and not feed down unless some mechanical means is used to force the carbon down on to the air blast. Next to this apartment of the furnace is located a blast flue into the end of which is connected a blast pipe delivering air at the pressure of 8 in. of water from an ordinary blower.

The wall dividing this air flue from the main apartment of the furnace in which the carbon is being burned, is checkered with air flues so that the air is driven into the carbon at the base of the main apartment and after passing through the body of carbon and combining with it, the resultant flame passes under an arch into the boiler setting at a point which would ordinarily be the ash pit. The heat of the flame when passing through this archway into the boiler setting is intense and the combustion is complete, all



Details of Gas Carbon Burner.

smoke being eliminated and after a few hour's run, the brick work of the furnace of the boiler acquires an almost white heat and it has been necessary to caution the firemen as to the limit of heat that can be maintained on this arch, the walls of the boiler setting and the tubes of the boiler. If care is not taken in regulating the blast on this furnace, the arch will be melted, necessitating the rebuilding of the furnace. An air blast is also introduced just below the filling doors of this furnace for the double purpose of forcing the smoke and gases, that are formed in the top of this apartment, down into the incandescent carbon at the bottom and also to gradually dry out and remove the moisture from the carbon and force it down through the fire. Air ducts are also placed through the top of the arch for the dual purpose of cooling the arch and aiding in the combustion of the gases, which are passing the arch, similar to the system used in an ordinary regenerative coal gas bench.

By reference to the prints, it will be seen that the air ducts in the dividing wall between the carbon apartment and the main air duct, are extended by the use of fire brick, so that the lower air ducts are about half way across the width of the main apartment. This is necessary because of the increased width of the bed of carbon at the base of the furnace, the idea being to give an equal depth of carbon in front of each series of air ducts. The combustion in the base of this furnace is intense. There are no grates used in the furnace, it is constructed entirely of fire brick and unless careful attention is given to it, by the firemen, the brick forming the walls and the arch of the furnace will be melted. On account of the accumulation of the slight amount of ash and clinkers, it is necessary about once in ten days to burn down the carbon in the furnace and clear out the accumulation of clinkers and melted brick.

Careful tests made on the boilers to which these furnaces were applied, have given evaporative value to this carbon of five pounds of water per pound of carbon. This carbon contained 40 per cent of moisture when introduced into the furnace. It has been found necessary to have from 30 per cent to 40 per cent of moisture in the carbon to obtain the best results and also to add to the life of the furnace. If carbon with a less per cent of moisture is used, the same amount of heat is not obtained and the fire burns well back into the furnace apartment and melts the openings of the air ducts. This seems to prove conclusively that each particle of carbon with its absorbed moisture is really a small water gas plant in itself. The splitting of the water into its resultant gases and their combination with the carbon, form a water gas that, unless handled with caution, will melt anything that it comes in contact with. By the use of these furnaces, together with storage hoppers above them and proper handling of the carbon by the latest improved mechanical appliances, the dread that every gas man has for the pile of carbon, should soon be eliminated and the profits of the gas companies increased in accordance with the increased efficiency of these furnaces over the ordinary method of burning this carbon.

RELATIONS WITH THE PUBLIC.[1]

BY S. M. KENNEDY.

It is only of comparatively recent occurrence that the majority of public utility companies have given any attention to the subject of relations with the public, and I am compelled to admit that if the importance of the subject had been recognized at an earlier date than it was, there would now be less absolute necessity of giving it the grave consideration it apparently deserves.

A few short years ago a gathering like the present would have deliberated almost entirely on such subjects as "The Merits of Oil Versus Coal for Gas Making," "High Pressure Versus Low Pressure Distribution," "Storage Capacity," "Service Connections," and "Meter Tests"—thinking that with these conditions satisfactory, good service would be assured. Today we recognize that good service only begins with the proper production of the commodity. A few short years ago, all the brains and ability of a company were centered in engineers and operators who could calculate how many thousand cubic feet of gas could be made from a ton of coal, or a barrel of oil, and who, at the end of a year, could explain how their calculations were so much more satisfactory than the operating facts developed. At that time the public was not given the attention it receives today. Cheap clerks and green boys could sell, bill and collect for something which everybody wanted and which could be procured from only one source in a community.

Notwithstanding the deliberations and discussions of the engineers, the service was not always perfect, and history states, complaints were frequently made, but not as frequently given the needed attention. But, note the change today. The presidents and directors of public utility companies are very much on the alert, and anxious to secure men who are able to meet and deal with customers in a manner that will give the customers satisfaction and reflect credit on the company. It has been said that the commercial engineer who can develop the business, and please the public, is much harder to obtain than the engineer who can run a plant or lay out a distributing system.

No one can deny that prejudice against corporations exists in the minds of many people throughout the country. Let us try to analyze how much of this prejudice has reasonable cause for existence, and how much of it may be classed as traditional. To a certain extent, the antipathy of part of the public is founded on hearsay, and not always supported by facts. It has been said "The evil that men do lives after them," and I have in mind the name of one man who put a stigma on public utility corporations which seems to hurt their standing in the public mind as much today as it did a quarter of a century ago, when the crime was committed. He was a gruff man, with a big head, cold looking eyes and a frowning face, devoid of one trace of magnetism. He was a conspicuous figure in the financial world, and the president of a great railroad corporation. I do not recall the circumstances surrounding the unfortunate utterance; I do not know whether or not he had any justification for using the words, but he is credited with having

[1] Paper read at 18th Annual Meeting Pacific Coast Gas Association.

coined the expression "The public be damned." The public loudly resented it then, and the public has since been unmistakably suspicious of corporations, and is ever ready to pounce on corporation words or actions which may have a "public be damned" look about them. Should the public be inclined to forget the words, there are those who will not let them do so. The objectionable sentence is the cheap phrase used as a headline in the yellow journal; the startling utterance of the professional agitator; the slogan of the self-appointed reform politician, and the squirming wail of the unreasonable customer.

Not long ago a company with a reputation for progressiveness, made a voluntary cut in its rate, and also put into effect some modifications in service regulations. A certain councilman in the benefited city, in an effort to minimize the value of the concessions, made a public utterance to the effect that the Great Northern Gas Company had changed from a "public be damned" corporation, to a charitable institution. Experience shows, however, that the majority of councilmen have much more amiable dispositions than the one to which I have referred.

You and I have had to work hard to combat the difficulties forced upon us by the wrongs committed, and the legacies left by others who were in the business before us. But, gentlemen, how often has the decent newspaper had to acknowledge that a company did not do the right thing when it had a chance! How often has the fair-minded business men blushed when he tried to defend the action of some corporation! How often has the cheap politician had good cause for his tirade against monopolies, and how often has the complaint of the reasonable man been met with scornful indifference! These conditions have existed in the past—yes, and maybe they too frequently exist today.

Prejudice against corporations is not likely to be entirely removed, because some varieties of the human family can never be satisfied. However, it is undoubtedly true that this antipathy can be greatly lessened by careful conduct on the part of the corporations, and the timely education of the public as to the real facts surrounding the production and sale of the utilities handled. All reasonable people are willing that a company that gives good service should receive fair profits. However, in a reasonable manner they must be shown just what rates are fair for the service given.

The one thing which is so frequently overlooked in connection with the gas business is that it is an intangible commodity. The purchaser does not see what he is buying, as is the case with ordinary merchandise. He cannot tell by his bill that he is paying only for what he receives. His senses, which are useful in buying other things, do not help him with his gas purchases. The only sense which sometimes comes into use is that of smell, and if he were to rely on that, he would often think he were getting ten times as much as his bill called for. Now, under conditions like these, we must rely on something to take the place of the senses, and the only substitute is represented by the word confidence. It will be through our relations with the public that this confidence will be established on firm ground, or wrecked in the quicksands of indifference.

Let us now consider what are the principal means or opportunities which we have for friendly relations with the public. It seems to me that they are four in number: (1) the press, (2) personal interviews, (3) letter writing and (4) the telephone.

The public utility corporation needs the columns of fair newspapers to help in educating its customers and the public generally as to the best uses of the commodity handled, and to counteract the effects of inaccurate and sometimes intentionally misleading information, which emanates from misinformed, unreliable or prejudiced sources, and which in the absence of other information is accepted as correct. Good advertising is as useful to the gas company as it is to the department store. If you feel that your customers are not using as many thousand cubic feet as they should, show them by newspaper advertising how they can with advantage to themselves use more. If the public has wrong ideas as to your business and its operation, use the reasonably disposed newspapers to put them right. You have no more important duty to your own interests than that of educating the public to a proper appreciation of existing facts, after you are sure they are what they ought to be. All publicity of misinformation should be counteracted by even greater publicity of the true conditions. The public talks of your enormous income; tell them about enormous expenses. Much is said about your tremendous profits; tell them about the great repair and maintenance bills you are called upon to pay; tell them about the depreciation bill which is running up against you day and night; and tell them about the small rate of interest earned on the capital invested.

Tell the public what you are really doing for them. Show them how constant and ready is your service. The consumer turns a valve in any part of his house; instantly the service is at his command. Does the grocer, butcher or baker serve him as quickly? Are the street car, or the telephone, or the telegraph companies at his command as readily? Let them know these and other advantages they possess through your agency. Tell of your difficulties, your successes and your plans for the future. Do not permit the impression to be created, through carelessness or lack of frankness, that the aim of the company is to take money irrespective of public obligations. You will have to be candid. You will require to be frank with them before you will have their confidence.

On the other hand, a lack of a reasonable measure of publicity is likely to be regarded as evidence of conditions which you desire to conceal for fear the knowledge of which would tend to create an unfavorable impression.

Let us now consider the subject of personal interviews. Yours may be a great company; abundant capital and many influential stockholders. Your president and directors may be excellent men, with high standing in the community, but the truth is they are probably known to only a few of your customers. Now, the public does not judge a company by its officers and directors, but by such employes as clerks, collectors, solicitors, meter readers, troublemen and others with whom business brings them into contact. These are the men who see the customers in your office, or meet them in their homes or places of

business, who represent the company in its intercourse with the public, and it is by the words and actions of such men that the public praises or condemns your company. Each man connected with your organization can do something each day to help your company's standing in the public mind. But one man's lapse into careless inattention, or lack of tact may undo in a minute all the good which you may have built up to your credit in a month. Clerks in the office, and employes working on the outside, do not fully realize their importance in connection with the success of the company's business. Sometimes those a little higher up than the employes mentioned, overestimate their importance, and do as much harm as those below them. An authority on the subject recently stated that "at least seventy-five per cent of public ill feeling against public service organizations has been failure of operating companies to take pains to please their customers." If such is the case, consider how important it is that each man should be informed as to what depends upon him, and have him realize that by his words and works the company is being judged.

You may issue instructions time and again as to the deportment of your men. You may print books of rules and regulations and distribute them throughout your different departments, but unaided they won't obtain the desired results. Your men must also be taken into your confidence. The heads of departments must know the company's policy and wishes, and must impart them personally to the men under them, and again and again, at every opportunity, by word and action, show how the public must be treated.

It is a fact much to be regretted, that as a rule there is not the right sympathy between the public and the gas company. Why does this condition exist? Is it because they do not understand each other? Well, why don't they? Because the company is largely at fault! True, the intention of your directorate may be perfect, but a certain undesirable place is reported to be paved with those things. Intentions must be followed by instructions, and instructions must be carried out by individual employes. It may be true that your business is the only one of its kind in your community, and that the public must come to you if it wants service. Did you ever stop long enough to consider that that very reason does not make the public less critical? If your customers are treated with consideration, it is particularly pleasing to them, but if with discourtesy, it rankles through and through, because they have no recourse, but must continue doing business with you. Customers will ask questions about what they do not know. Employes may be asked the same question fifty times a day, by fifty different people. But what of it! They all want the information, and if answered politely, will usually be satisfied. Each man representing a point of contact, who meets the public personally, should be selected and fitted for his position. At your plant you use great care in the construction of your machinery. You would not think of putting a half inch rivet into a one-inch hole and expect it to work satisfactorily. You would not permit a rough surface to remain on a valve which you must handle constantly. Well, keep your eye on your office and use the same amount of sense. Don't expect an inexperienced boy to handle your complaints satisfactorily. Get more mature men. They will handle the public better, and the public likes to talk to them. Look out for the men with the rough surfaces; the men who prefer to argue and not explain. They may win many arguments, but they lose many friends for your company. While your mind is on your office force, take a look at the office itself. That high railing and grill work is not necessary, and obstructs the view. Take it down. Those little windows through which your clerks talk have a stand-off appearance; abolish them. Let the public see into your office and learn what your men look like. Let your men have a chance to mentally put themselves in the customers' place. Perhaps it will help them to understand each other better.

Letter writing is of great importance in connection with the relations of the larger companies with their customers. Many complaints are forwarded in letters; many inquiries are received, and requests made. We all know that a letter itself is only cold type and thin paper. The gesture, the facial expression, the twinkle of the eye and the nod of the head, are all absent. Just the words are there to do the talking. Consequently we must be more than careful. After what we have dictated has been forgotten, the letter remains in the other fellow's possession, and he may take it up, now and again, to look at it. If it contained anything that hurt when received, it probably hurts more each time it is read, and likely the reader is loading a gun for some one. A hot letter sent in reply to a caustic letter received, is poor business. Your letter may be really smart and burn with righteous indignation, but what good does it do your company. Suppose your customer had some grievance, real or imaginary, he had better be conciliated. If not, he will become more angry, and talk against you, and take his business somewhere else at first opportunity. Your company's letters to customers should be handled by experienced employes.

Have you ever recognized how much of your particular business is handled over the telephone, and with what rapidity the number of telephone calls increase? This point of contact bids fair to one day become the most important of all. Perhaps even today the telephone is the door through which most of your patrons enter. Better be sure it is well oiled and well attended. You probably have a private exchange. Does your operator answer pleasantly with the company name, and connect at once with the person and department wanted? Do you know that when the department answers, as well as when the operator answers, the response is clear and courteous. Some one responsible in your office should see that employes handle all telephone calls with the same degree of care as they do when attending to patrons who make personal calls at your office. The telephone is a great factor in your business, and should be developed with the care and attention its importance merits. Insist on telephone calls being answered promptly and pleasantly. Experience has shown that over the telephone as nowhere else, pleasant tones and courteous language are required. One must make his impression entirely through what he says and the

way he says it. The telephone of some companies is frequently a liability, but it can and should always be made a valuable asset.

In all of a public utility company's relations with the public, the attribute of tactful courtesy should be paramount. This quality attracts the new customers you are looking for, and makes the older ones feel at ease and satisfied. It is in fact the open sesame to the public good will. It must now be acknowledged that a company cannot long be successfully operated without the good will of the public. No company can afford to assume an independent attitude. No matter how big the corporation, it is vulnerable; its very greatness sometimes making it a bigger and a better target. And as for independence, the man who runs a peanut cart, and has only a five-dollar capital invested in his business, is a thousand times more independent than the corporation, with its millions. This good will we want does not come by saying one thing and doing another; it comes by doing the right thing—the square thing, all the time; by giving care to what is promised, and by keeping the promises made.

This real courtesy we are talking about does not mean palaver, bowing and scraping, but common, ordinary, every-day politeness. It does not mean toadying to customers, whether they are big or little, but the giving to all a cheerful attention. It is the kind that gives and wins a smile; the kind that does not forget to say "thank you" when the opportunity occurs. This sort of courtesy is a fine art, and is as necessary to the healthy growth of your business as is the sunshine to the flowers.

The larger a corporation becomes, the greater the tendency to drift farther and farther away from individual consumers. Instead of speaking of "our customers," we speak and think of the public. Now, that is just the condition that our customers do not like. They object to being herded, and desire their individuality to be recognized. The representatives of a corporation in any city should be men who are identified with the city's interests in public matters; should be connected with civic and commercial bodies, and known to be working for the up-building of the municipality. A line up with commercial clubs, boards of trade, and similar broad-gauge civic bodies, will eventually be more profitable than patronizing politicians, and wasting time in attempting to manipulate political machinery.

Let us encourage our men to know and remember our customers by name. They are human and like it. Of course, each man cannot remember all of the company's customers, but each man does not come in contact with all. It is those he constantly meets that the employe should be expected to know. One of the best ways to know a customer is when he comes with a complaint. If a man has a complaint rankling in his breast, the only thing to do is to get it out. Troubles and complaints are opportunities to make friends; and friends made this way are good workers for you and your business.

Much is said these days regarding the "public policy" of companies such as are represented here, and almost every gas and electric association in the United States has a standing committee that brings in regular reports on the subject. Now, there are two definitions to this word policy, (1) A system or method for the administration of the affairs of a government or of any institution; (2) Management or administration based on temporal or material interest, rather than on principles of equity—hence, worldly wisdom, cunning, stratagem. It will be remembered that I am not now speaking for any company or organization, but for myself alone. Consequently, I am free to state that there are times when I have seen or heard of the word policy being used in the latter sense that I have been tempted to exclaim "policy be damned." Away back some years ago, when I was learning to write, I spent hours copying a headline which read "Honesty is the best policy." I have learned since those days that it is a good thing to be honest, and if one has no other reason for his honesty, let him be so as a policy. But all the same, it is a mighty poor reason.

Maybe we consider policy too much in our relations with the public. When I borrow my neighbor's lawn mower, and he gets the loan of my wheel-barrow, we don't think of the question of policy. We are neighborly, and that's all there is to it. When I want to buy a cigar, or a necktie, or a pair of shoes, I don't consider the question of policy—I just drop in to some store I know, and select what I want. I probably know that the man keeps the desirable kind of goods; that his prices are right; and that he and his assistants are courteous, and have a smile or a word of recognition when they see me. In personal matters, I may sometime think of reciprocity, but not of policy. Our customers should realize that, after all, a corporation is only an aggregation of individuals. I recognize that some things must be done for politic reasons, but why should a corporation eternally require to study policy? Why not the man to man idea, instead of "the corporation and the public" attitude? Why not have customers go to your office to do business feeling that they like to do business with you? Why not cut out the word policy in the sense it is usually accepted by corporations, and let your patrons understand that the only policy you know in connection with your company is "the public be pleased." That policy does not mean giving way to all demands. It does not necessitate loss of dignity, self-respect, or income, but, on the contrary, when faithfully carried out, it represents the easy, safe and profitable way of doing business. With a "public be pleased" policy, your difficulties will decrease in proportion with the length of time it is in effect, and the subject of "relations with the public" will gradually be changed from a vexed problem to a condition closely resembling that of pleasure.

The largest induction coil, hitherto the famous Spottiswoode, is now stated to be a German coil which gives a 50 in. spark, requiring 30 amperes at 110 volts. The iron core is 80 in. long. The primary coil consists of six layers of copper tape, making altogether 792 turns, and the secondary coil contains 100 miles of copper wire about one-hundredth of an inch in thickness.

A SYSTEM OF RATES FOR ELECTRIC LIGHT AND POWER AND ITS APPLICATION.[1]

BY STEPHEN A. HOAG.

Electricity is a manufactured product and, like other manufactured products, the cost at which it is sold should be proportional to the cost at which it can be produced.

If electricity could be manufactured continuously at a uniform rate and then stored away to be supplied when required, it could, like many other manufactured products, be sold at a uniform price. But electricity cannot, like oil, be drawn from a barrel when wanted. nor like gas, taken from a holder where it is stored; manufactured goods can be made and placed in warehouses to be supplied when there is a market for them, water can be pumped steadily from wells to reservoir where it is held subject to the demands of the consumers, but electricity must be manufactured the instant it is used; the generators must turn and the network of distribution lines must be kept hot, holding in reserve current subject to the instant call of every customer on the line. Now, if the requirements of these customers came at various odd times during the day they might be made to fit in and overlap one another and produce some sort of uniform load, but unfortunately this is not the case, for their demands occur simultaneously as darkness comes upon us all at the same time and artificial light is needed to prolong the daylight hours. This means that an electric generating station must have an excess of capacity over that ordinarily required simply to supply current during one or two hours of the working day, moreover, as darkness comes an hour or two before the close of the working day in winter, while it comes after the close of the working day in summer, it follows that the demand upon the electrical generating station in the winter will be much in excess of the demand during any other season of the year.

To arrive at a proper rate of charge for electrical energy it is first necessary to determine the nature of the costs which enter into its production and then to properly proportion these costs among the various customers served so each shall bear his just share and automatically earn the rate which he gets.

For every electric light plant with its distributing system, there are certain overhead expenses which are independent of the output or kilowatt hours generated. These are the fixed expenses of interest and depreciation, taxes, insurance; also salaries of officers, general office expense, advertising, legal fees, etc. All these expenses go on day by day whether current is sold or not. Then there are the variable expenses of operation which are directly proportional to the output. Among these is included fuel, if the plant is operated by steam, also oil, waste and miscellaneous supplies, wages of various operators, maintenance of machinery, cost of operating lamps and meters, incandescent lamp renewals, etc.

From the fact that, as we have seen, a plant of large excess capacity is required to take care of the heavy lighting demand of the winter peak, it is evident that the fixed charges on this large investment will constitute a large part of the total cost of producing current, also that the more hours this plant is operated each day, and the greater the number of kilowatt hours produced, the lower will be the unit cost per kilowatt hour, since the fixed expense remains constant while the running expense varies with the output.

To illustrate in figures: Consider the case of a plant of 400 kw. rated capacity costing $100,000 ($250 per kw.), for generating and distributing system complete; assume the fixed expenses not proportional to output as 16 per cent of total cost ($16,000 per year). Assume variable expenses at 2 cents per kw.-hour. Then if this plant were to run 24 hours per day for 365 days of the year (load factor of 100 per cent), it would generate 3,504,000 kw.-hours and the fixed expenses of $16,000 divided by 3,504,000 gives a fixed charge of .456 cents per kw.-hour, which, added to the variable charge of 2 cents, gives a total cost of 2.456 cents per kw.-hour for current produced. If, however, this plant operated only one hour per day (load factor of 4.17 per cent) instead of 24 it would generate 146,000 kw.-hours and $16,000 divided by 146,000 gives a fixed charge of 10.958 cents per kw.-hour, and adding 2 cents to this gives 12.958 cents total cost per kw.-hour generated. The following table shows the variation of the total cost of current with different number of hours' operation of plant per day, or what is the same thing, different load factors:

Average daily hours use.	kw-hour output.	Load factor.	Fixed Exp. per kw-hour output. Cts.	Variable expenses. Cts.	Total Cts. per kw-hour
¼ hour	36,500	1.04	43.84	2	45.84
½ "	73,000	2.08	21.92	2	23.92
1 "	146,000	4.17	10.96	2	12.96
2 "	292,000	8.34	5.48	2	7.48
3 "	438,000	12.50	3.64	2	5.64
5 "	730,000	20.80	2.19	2	4.19
8 "	1,168,000	33.33	1.369	2	3.37
10 "	1,460,000	41.66	1.09	2	3.09
16 "	2,336,000	66.66	.685	2	2.68
24 "	3,504,000	100.00	.456	2	2.45

Now the load factors of its customers combine to make the load factor of the central station, also we are agreed that current should be sold at a price which is proportional to the cost of its production. It follows that a correct rate system must take into account the load factors of consumers and must be so designed that as the consumer increases the number of hours per day that he uses his load, he will automatically get a lower average rate.

This result is accomplished in the so-called "readiness to serve" and "maximum demand" rate systems. In the "readiness to serve" system each consumer is subjected to a fixed charge per month or per year for current held in reserve for him, said charge being proportional to the number of lamps which he has installed and their resulting maximum demand upon the generating systems; the consumer then pays an additional low uniform rate per kw.-hour for all current he actually uses. The fixed or readiness to serve charges are intended to cover those fixed or overhead charges on the generating and distributing system of the central station serving him and the additional rate per unit of current used is intended to cover those operating costs proportional to output.

An example of this rate system is the Doherty system used in Denver, Colorado, where a fixed charge per year is made for each 16-candlepower lamp connected, an additional fixed charge per year for the cost of serving each individual customer, plus a uniform

[1]Read at convention N. W. Electric Light and Power Association, Seattle, Aug. 27, 1910.

rate per kw.-hour for all current used. Another example of a "readiness to serve" system is that in St. Louis, Missouri, and Seattle, Washington, where a guaranteed minimum charge per month is made for each 16-candlepower lamp connected and all current used above this minimum is charged for at a uniform rate per kw.-hour. By guaranteeing a larger minimum per lamp per month, the customer may obtain a lower rate per kw.-hour, which is right, since he thereby increases his load factor.

A variation of the above "readiness to serve" system is the "maximum demand" or "differential" rate system consisting of a primary or base rate per kw.-hour and a lower secondary rate. The base rate applies to a certain number of hours' use per month of the maximum current demand which the consumer calls upon the station to supply, and the lower rate applies to all current consumed in excess of this amount. The consumer does not get the benefit of the lower rate until he has used enough current at the higher rate to reimburse the company for the fixed charge on that particular portion of their capacity which is tied up or reserved for him.

That the above "readiness to serve" and "maximum demand" rate systems are very similar is shown by the following example:

In a certain Western city the lighting rate is 15 cents per kw.-hour for the first 30 hours' use per month of the maximum demand and 5 cents per kw.-hour for all current used above this amount: in a neighboring city the lighting rate is $3 per kw. of the maximum demand per month plus 5 cents per kw.-hour for all current used. Now, with a maximum demand of 1 kw., 30 hours' use at 15 cents per kw.-hour equals $4.50; likewise, 30 hours' use at 5 cents per kw.-hour equals $1.50, which added to the $3 readiness to serve charge equals $4.50, consequently these rate systems above a 4 per cent load factor are identical. They show a difference only for those consumers who use their maximum demand less than one hour per day. These consumers get a lower rate under the "differential" system.

Comparing the above two rate systems, the "readiness to serve" system theoretically fills more closely the requirement that electric power should be sold at a price proportional to the cost of production, and if this is strictly observed in making out any specific case of rates it will usually be found that the short hour user has to pay rather a high rate per kw.-hour for his current. While this is correct in theory, in practice it is usually considered advisable to reduce his rate and actually serve him at a loss, increasing the running charges on the other class of customers enough to make up the difference, because the short hour user and small customer form the largest percentage of customers served and their good will is much sought by the central station, for it is through them that franchises are obtained and expression of public opinion voiced by the press. Reducing the rate to the short hour user also tends to prevent the introduction of gas and gasoline lighting, for it is the customer who has the large installation and uses it for only a few minutes each day in the summer months or perhaps only once a week, on Saturday nights, who most bitterly objects to a high minimum charge and, if he is forced to pay it, goes to the gas company. The moral effect on a newcomer of an electric lighted town where one has to search closely for a gas lighted store, has a great advertising value to the electric company and is a credit to its rate system. For the above reasons I would consider the "maximum demand" rate system with a fixed maximum rate per kw.-hour preferable to the "readiness to serve" system.

We have seen that a rate system, to be correct, must (a) take account of load factor. There are two other requisites which it must also have: it must recognize the fact that (b) the large user of current earns a slightly better rate than the small user; (c) the power user earns a better rate than the light user.

Discussing condition (b) it is evident that a large volume of business at a single point of delivery earns a better rate than the same amount of business distributed over a large area, for it is much cheaper to deliver large blocks of power at one location than an equivalent amount of power to a number of small consumers. The cost of handling individual accounts is saved as well as the additional expense for distribution lines, small transformers and meters.

The Doherty rate system recognizes this by applying a uniform service charge to each individual consumer. A more usual method is to provide discounts for large quantities of current used, these discounts increasing with the size of the bill.

Discussing condition (c): power rates should be lower than light rates for two reasons. (1) The variable expenses per kw.-hour are lower due to certain costs which enter into light service but do not enter into power service—among these expenses are lamp renewals, arc and Nernst lamp repairs and trimming, additional expense and attention necessary to maintain good voltage regulation and reduce complaints. (2) The fixed expenses are lower by reason of the higher diversity factor of a power load. Light demands necessarily come on simultaneously as artificial light is used to prolong daylight and follows natural laws. Power demands of various motors, on the other hand, do not tend to come on simultaneously but vary with the individual conditions affecting them and fit in and overlap one another.

Data collected from various central stations having a large power load indicate that the ratio of the actual demand produced on the generating station, to the rated horsepower of the connected load in motors is 1 to 4 or greater. Contrasting this with a ratio of 1 to 1.5, which approximately represents the ratio of the demand on station to connected load in lamps, we see that the power load should not bear as heavy a proportion of the fixed charges as the light load, hence the "readiness to serve" charge or the base rate for power should be less.

In addition to making its power rates lower than its lighting rates, the central station should also make a further reduction for power used "off peak"—that is within certain specified hours of the day, which hours mark the beginning and ending of the station peak load during the different months of the year. These hours should be specified in the contract and their strict observance should be enforced; this can be accomplished by having the company's inspectors or

solicitors "drop in" occasionally on the customer during those hours when he is supposed to be closed down, or it can be profitably accomplished in the case of large power customers by installing graphic-recording wattmeters or ammeters which serve the double purpose of recording the time at which the load goes off and the amount of the maximum demand.

In arriving at this off peak schedule of rates, the fact to be considered is that the running charge should remain constant and the readiness to serve charge should be reduced, for since this power load by agreement cannot overlap the lighting peak, it does not require or tie up any additional equipment in the generating station but uses the same equipment on which the fixed expenses are already being met by the lighting customers. Theoretically, the fixed charges in this case should be only that necessary to take care of the charges on the investment in line and equipment necessary to serve the particular customer; however, it would not be practical to agree to supply power on this basis, as the company would have no protection against the customer shutting down his plant.

As to minimum charges for power rates: where power is sold on the "readiness to serve" basis, the "readiness to serve" charge per kw. of course is the minimum, but where power is sold on a sliding scale or differential rate basis, there should be a minimum charge per horsepower of rating or demand. This charge varies with various companies, running from 50 cents per horsepower per month upwards; however, $1 per horsepower per month is the most common minimum and is, I think, the fairest for all classes of users. It is low enough to encourage the use of small motors of from 3 to 10 horsepower in stores and small factories and it is high enough to ensure the power company a return of $12 per year per horsepower of connected load, which, as we have seen, equals $48 per horsepower or $36 per kw. per year of maximum demand produced at the station.

Maximum Demand of Power Load.

To arrive at the maximum power demand on which to base a minimum charge, a readiness to serve charge or a base rate, is sometimes difficult. For a single small motor, or two or three motors, the basis should be the horsepower rating, but where a factory with numerous motors must be considered or several large motors operating at an unknown load, measurements should be made from time to time and the actual maximum demand of the installation in question determined.

If the revenue from the installation will justify installing a graphic-recording wattmeter, this is desirable, in fact I have in mind several cases where this is done and power is sold at a flat rate per horsepower per year, based on the reading of this meter. The readings on which the customer is billed each month are a given number of peaks of a certain number of minutes' duration as defined in the contract and this maximum demand once recorded holds until the expiration of the contract or until the meter subsequently records a larger maximum. This method of selling large blocks of power leaves no doubt as to the revenue which will be returned per kw. per year.

Maximum Demand of Light Load.

To arrive at the maximum demand of a lighting load the "maxmeter" or "Wright demand meter" is frequently used. This shows the maximum current in amperes which the given load produces and is satisfactory in some cases. It records with comparative accuracy when used with carbon, incandescent and metallic filament lamps, but is inaccurate when used with Nernst lamps and arc lamps, due to the heavy starting current; however, since the tungsten lamp is rapidly replacing other forms of illumination the maxmeter can be used. But the maxmeter is not always necessary; we know that in certain classes of business the maximum demand is the full connected load, we also know from experience and previous measurement that in other classes of business the ratio of the maximum demand to the connected load is definite—two hotels, for example, similar in size and character, should have the same ratio; likewise two similar office buildings in the same locality. It is advisable to collect and tabulate data as to the ratio of maximum demand to connected load for the various classes of business handled by any one power company. This information can then be used in applying rates and estimating monthly bills in the case of new business.

Residence Rates.

Residence lighting follows the same laws as commercial lighting except that the peak occurs somewhat later, which is an advantage. When "readiness to serve" or "maximum demand" rates are applied to residence lighting, the demand taken should be from 33 1/3 to 50 per cent of the connected load, otherwise the rate will be too high. A residence rate should be so designed as to encourage the use of cooking and heating devices, flat irons, vacuum cleaners, and in fact any device used outside the regular lighting hours. To accomplish this it is necessary that the current used by these appliances come in under the secondary rate, hence they should not be figured in on the maximum demand. Some companies make a special heating and cooking flat kw.-hour rate without minimum and require a separate circuit and meter to be installed for this purpose. However, the wisdom of this is doubtful, as the additional expense of wiring is likely to discourage the customer and a separate meter means more work for the operating and accounting departments of the power company and hence additional operating expense. The same result can be accomplished by the differential rate with a properly applied maximum demand. A form of residence rate frequently used in connection with the maximum demand commercial rate is a sliding scale rate independent of connected load; say, for example, 10 cents for the first 20 kw.-hours used per month, 9 cents for the next 20 kw.-hours, 8 cents for the next 20 kw.-hours and 5 cents for all current in excess of 60 kw.-hours per month. This form of rate saves the trouble of keeping a check on the installation of lamps and its low secondary rate encourages the use of current consuming devices. It should certainly receive consideration.

On all residence rates a minimum charge of at least one dollar per month should be made, as the customer's account cannot be profitably handled for less than this.

Rates for Special Uses of Current.

Sign lighting and outline lighting should be encouraged as they help to increase the load factor. A flat rate for this class of business is desirable, the power company to maintain the lamps. This flat rate can be figured on the basis of the secondary meter rate of the rate system, allowing six hours a day use of current or 25 per cent load factor; this reduces to a flat rate per lamp per month and the signs can be turned on and off at certain definite hours by men employed by the company or the signs can be operated from a "sign circuit" controlled from power house or substation.

Certain classes of business not strictly a power load should be taken at power rates. This applies to blue printing machines, moving picture arcs, tailor's irons and laundry irons, and in fact any load which has the characteristics of a power load and is large enough to justify the installation of a separate meter and circuit. Such devices used on a lighting circuit must of course take lighting rates, but in this case their maximum demand may be estimated at one-half its actual amount since the diversity factor of these devices approaches that of a power load.

Rates for charging storage batteries for automobiles, etc., should be those of the off peak schedule above referred to, as this current can easily be used outside of the peak load hours.

The Lamp Question.

In my opinion a power company should furnish free the first installation of 8, 16 and 32-candlepower lamps to its customers and should also furnish free renewals of these lamps when they burn out. In this way they will control the voltage and make of the lamp used and the customer will get the lamp best adapted to the current furnished. As to the proper wattage of lamp to use, I believe that the Gem metallized filament lamp of 2.5 watts per candlepower nominal rating best fills the requirements. These lamps can be renewed free in the 50-watt and 80-watt sizes, and by using them at their bottom voltage, a life is obtained equal to or better than that of the ordinary 3.5-watt carbon lamp, while the current consumption is much less. Since the first cost of these lamps is slightly in excess of the carbon lamp, the renewal cost per 1000 hours will be about the same, while they give a whiter light and produce better satisfaction among customers. Their use will reduce the load on overloaded lines and transformers and improve the regulation, and by reducing the station peak load will leave more current available for new business. At the same time, with a proper rate system such as we have outlined, the revenue to the central station will be but slightly reduced and this will be much more than made up by the taking on of new business, on a maximum demand basis.

The cost of lamp renewals should of course be kept track of along with other operating expenses and the kw.-hour rate designed to provide for this.

The above remarks as to reduction of station peak by the used of high efficiency lamps also applies to tungsten lamps, only to a greater extent, and with the right kind of rates little need be feared from the general use of tungsten lamps. I am of the opinion that central stations should sell tungsten lamps to their customers slightly above cost and not attempt to maintain these lamps or rent them. If they do undertake the maintenance this should be kept entirely as a separate proposition and not affect the rate per kw.-hour.

In conclusion I may say that it is difficult to lay down a general rate system which will be applicable to all conditions and localities. There may be a public service commission which has favored some particular form of rate and there may be a clause in the company's franchise which specifies the maximum rate to charge. However, the principles of a correct rate system and the application of this system to different classes of business may be laid down, and this I have endeavored to do. By a proper system of accounting and a proper division of the costs under the heads of maintenance, operating expenses and general expenses, it should be possible for any one plant to determine very closely those expenses which are independent of and those expenses which vary with the output in kw.-hours.

The segregation of fixed charges and running charges can then be made and by the proper application of a diversity factor, the fixed charges apportioned among the consumers in accordance with their demand. Those expenses which are peculiar to light service and do not occur in power service can also be segregated, and the proper difference then made between the light and the power running charges. In this way there will be obtained definite rates for any one set of conditions.

Renewing carbon lamps whose filaments are not broken is accomplished by German manufacturers by admitting air to the bulb after unsealing the cap and then burning off the deposited carbon. The air is then exhausted, carburetted hydrogen introduced and the lamp connected in an electric circuit. As the filament glows it absorbs carbon until it has resumed its original section, when the lamp is sealed and made ready for use.

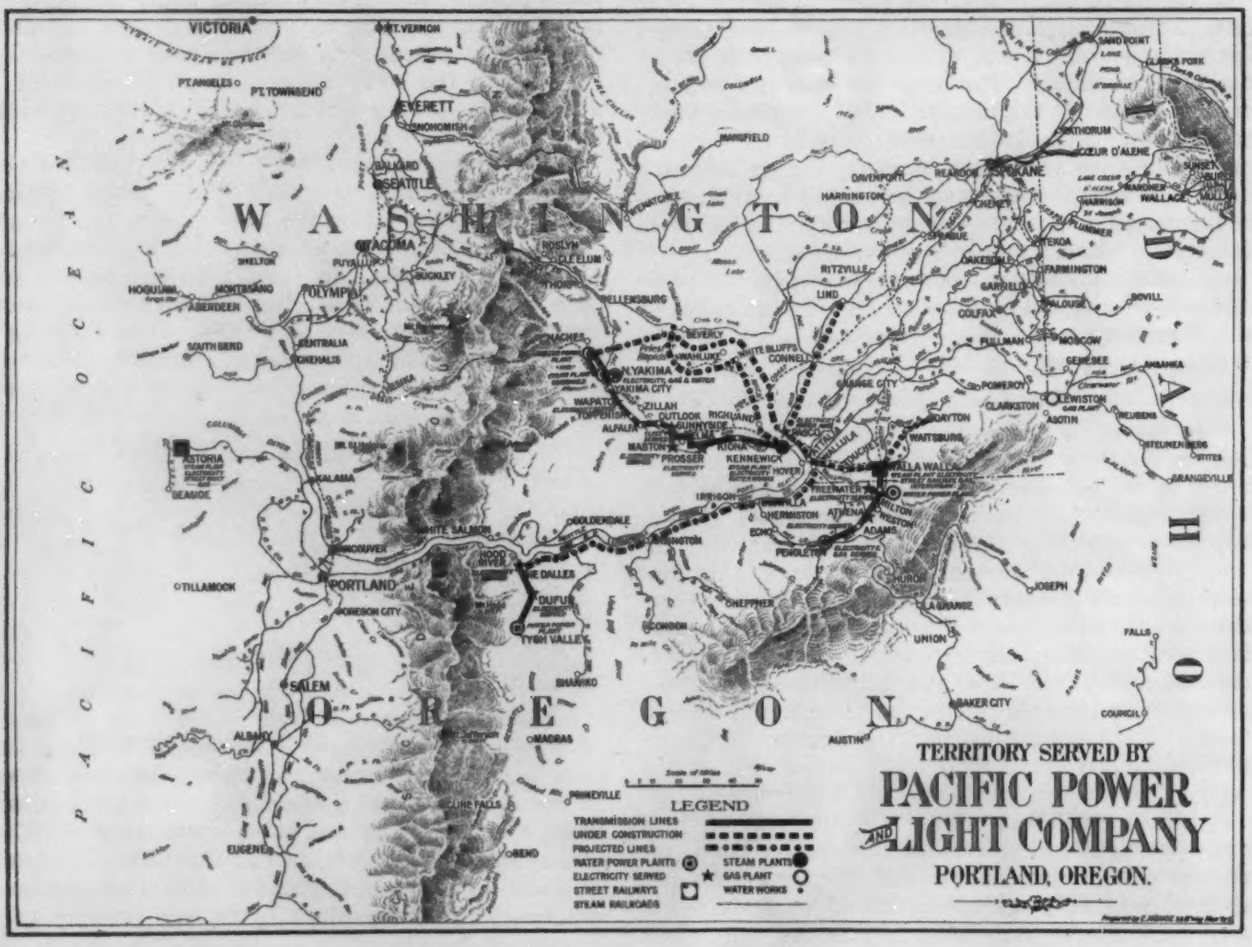
Metallic radium has been isolated by Madame Curie in collaboration with Monsieur de Bierne. The metal is highly oxidizable, and from a clear white soon becomes black. It adheres firmly to iron, decomposes water, burns cellulose, and is rapidly dissipated. This pure element was obtained by electrolysis of the salt, by which means a milligramme of radium amalgam was secured, and on distilling off the mercury at a temperature of about 700 degrees C., the pure metal was left behind.

Mussels in the condenser circulating system have seriously interfered with the operation of a number of English electrical plants. The spawn passes through all strainers and find the iron suction pipe in sea water an excellent home. They soon grow to a large size so that the effective bore of one 30-in. pipe was reduced to less than 16 in., greatly restricting the flow of water to the condensers and putting an overload on the pumps and motors in order to circulate sufficient cold sea water to condense the steam and maintain the vacuum necessary for efficient turbine operation. All suggestions such as boiling, poisoning or electrocuting the molluscs had proven impracticable, and as scraping is impossible, it will probably be necessary to lay a new pipe system above water level with convenient man-holes.

PACIFIC POWER AND LIGHT COMPANY.

With the recent changing of hands of a number of Northwestern power plants which has resulted in the organization of the Pacific Power & Light Company, incorporated in Maine with a capital stock of $7,500,000, the new company has assumed active operation of about a dozen gas and electric plants, including the Astoria Electric Company, operating gas, electric and street railway plants at Astoria, Oregon. Wasco Warehouse Milling Company operating electric distributing systems at Dufur and The Dalles, Oregon, water power station at Tygh Valley, Oregon, and 35 miles of 22,500 volt transmission line. Northwestern Corporation, operating fifty miles of 22,500 volt transmission line between Walla Walla, Washington, and Pendleton, Oregon, hydroelectric station on the Walla Walla River, distributing systems at Pendleton and Freewater, Oregon, and Walla Walla, Washington; gas plants at Pendleton, Oregon; Lewiston, Idaho; Walla Walla and North Yakima, Washington. Northwest Light & Water Company operating hydroelectric plant on the Naches River with electric distributing system at North Yakima, Washington, and water works at North Yakima. Yakima Valley Power Company operating 100 miles of 66,000 volt transmission line between North Yakima, Wapato, Sunnyside, Kennewick, Mabton, Kiona and Pasco, Washington. This company also owned the water works at Kennewick and Pasco, Washington, and an electric steam generating station at Kennewick.

The new company has in operation about 185 miles of high tension transmission line, all three-phase, 60 cycle. It is now building 50 miles of 66,000 volt transmission line between Pasco and Walla Walla, Washington, the completion of which is expected within a month. Work is also progressing on the rebuilding of the North Yakima Gas Works, Walla Walla electric sub-station and the Tygh Valley generating station. This work will cost several hundred thousand dollars.


VICTORIA
PACIFIC OCEAN
WASHINGTON
OREGON
IDAHO
TERRITORY SERVED BY
PACIFIC POWER AND LIGHT COMPANY
PORTLAND, OREGON.
LEGEND
TRANSMISSION LINES
UNDER CONSTRUCTION
PROJECTED LINES
WATER POWER PLANTS
ELECTRICITY SERVED
STREET RAILWAYS
STEAM RAILROADS
STEAM PLANTS
GAS PLANT
WATER WORKS
PORTLAND
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EVERETT
ABERDEEN
OLYMPIA
ASTORIA
SALEM
EUGENE
BEND
PENDLETON
WALLA WALLA
KENNEWICK
PASCO
PROSSER
KIONA
MABTON
SUNNYSIDE
WAPATO
YAKIMA
NORTH YAKIMA
ZILLAH
GRANGER
TOPPENISH
ALFALFA
OUTLOOK
HIGHLAND
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GOLDENDALE
WHITE SALMON
HOOD RIVER
THE DALLES
DUFUR
TYGH VALLEY
SHANIKO
MADRAS
PRINEVILLE
CROOKED RIVER
REDMOND
CULVER
METOLIUS
CHEMULT
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MERCED
LOS BANOS
GUSTINE
NEWMAN
PATTERSON
CROWS LANDING
OAKDALE
RIVERBANK
KNIGHTS FERRY
SONORA
TUOLUMNE
JAMESTOWN
SONORA
COLUMBIA
SONORA
MOKELUMNE HILL
JACKSON
SUTTER CREEK
AMADOR CITY
PLYMOUTH
DRYTOWN
IONE
PINE GROVE
PIONEER
VOLCANO
PINE GROVE
SUTTER CREEK
JACKSON

A. McArthur. The operating officials are as follows: General manager, A. S. Grenier; chief engineer, D. F. McGee; general superintendent, Geo. C. Arrowsmith; new business manager, J. E. Davidson. The New York offices are at 71 Broadway, New York City. The Portland offices are at 1211 Spalding Building, Portland, Oregon.

Pacific Power & Light Company is controlled through stock ownership by the American Power & Light Company of New York. American Power & Light Company is controlled by interests affiliated with Electric Bond & Share Company of New York. American Power & Light Company also owns the Kansas Gas & Electric Company of Wichita, Kansas, and Portland Gas & Coke Company of Portland, Oregon, and recently announced that American Power & Light Company had also purchased the controlling interest in the Hanford Irrigating and Power Company, which owns an electric generating station at Priest Rapids, Washington, and about 30,000 acres of irrigable land in the Columbia Valley.

The Pacific Power & Light Company owns the Walla Walla Valley Railway Company, which is operated independently from the electric business. The general manager of the railway company is C. S. Walters and the traffic manager E. G. Miller, both of Walla Walla, Washington.

President S. Z. Mitchell of the Electric Bond & Share Company and about thirty prominent Eastern bankers, recently made a trip through Oregon and Washington, inspecting the property of the Pacific Power & Light Company and the Portland Gas & Coke Company. Mr. Mitchell announced that arrangements would be made for the expenditure of several millions of dollars for improvements on the properties of these two companies during the next few years. Efforts will be made to popularize the use of electricity for irrigating purposes throughout central Washington as the Easterners believe a large field is open for that purpose.

PRIZE FOR SCIENTIFIC ESSAY.

The Association of Electrical Engineers, graduates from the Montefiore Electro-Technical Institute, has recently issued a prospectus of the conditions governing competition for a prize to be awarded during 1911.

This prize, consisting of the accumulated interest on 150,000 francs ($28,950), in Belgian 3 per cent bonds, is to be awarded to the author of the best original work presented on the scientific advancement, and on the progress of electricity in its technical applications. Articles may be written either in French or English, and printed or in typewritten manuscript.

The jury will be ten electrical engineers, five Belgians and five other nationality, under the presidency of the director of the Montefiore Institute. Twelve copies of each contribution must be sent postpaid to M. le Secretaire-Achiviste de la Fondation Georges Montefiore, Rue St. Gilles, 31, Liege, Belgium, before March 31, 1911.

WHERE ANTONE LOST OUT.

BY ANTONE'S BROTHER.

The little tale we will herein relate happened a little less than a million miles from the city and county of San Francisco, and will, I trust, elucidate the fact, as Brother Antone found out to his sorrow, that the great and the near-great, especially the great, are frequently too small to acknowledge their error; thinking that by doing so they keep the fact of their mistakes from the knowledge of their superiors or employers, and endeavor to impress them with the fact that they never make a mistake.

Now, when Antone started out in the business he did not know that it paid not to know some things that the consulting engineer of the company did not know, and he started out to get the best results for his employer, the company.

He happened to work his way up until he was placed in charge of considerable electrical apparatus and as the company did not generate their own current, but purchased on a meter basis, he carefully checked up the apparatus they were operating until he came to the conclusion that they were not using the power they were paying for.

He obtained a test meter and made some tests which verified his investigation, and as the bills were to be O.-K.'d by him he refused to pass them. But they went through the office and were paid anyway. This matter continued for several months. Finally the consulting engineer of the company was called in to make an investigation and stated that there was nothing to his report, that the meter was all right.

Now, Antone did not like to swallow this, but said nothing until he had a chance to talk to the consulting engineer, who graciously informed him not to lose any sleep over the matter, that when he had tested as many plants as he had that he would not bother with a simple little thing like that, as he had investigated the meters and there was nothing wrong.

Things went along until the first of the month came again, when, upon the bill being presented for his O. K. he refused to pass it, and as usual it was paid at the office. But a few days later Antone received a letter stating that if he did not make good on his claim that he would be fired, and he was wanted up at the main office.

Antone went up to the manager, who advised him of the above fact, when he stated that if he could not prove his contention it was time for him to be fired. Whereupon he was told to go ahead.

Antone got one of the large company engineers whom he felt confident could conduct a test which would be correct, when they found that the constant used was fully 40 per cent higher than it should have been. As a result the company got a rebate on their power bill of several thousand dollars.

Question: What did the consulting engineer do? (He said nothing). What did Antone do? (He got fired a short time thereafter).

Moral: When you are riding a mule, soak him if he don't stand still when you holler whoa (but if you happen to be in the mule's place, stand still).

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POWER AND GAS

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NOTICE TO ADVERTISERS

Changes of advertising copy should reach this office *ten days in advance of date of issue.* New advertisements will be accepted up to noon of Monday dated Saturday of the same week. Where proof is to be returned for approval, Eastern advertisers should mail copy at least thirty days in advance of date of issue.

Entered as second-class matter at the San Francisco Post Office as "The Electrical Journal," July 1895.
Entry changed to "The Journal of Electricity," September, 1895.
Entry changed to "The Journal of Electricity, Power and Gas," August 15, 1899.
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FOUNDED 1887 AS THE
PACIFIC LUMBERMAN, CONTRACTOR AND ELECTRICIAN

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Rate Confusion

Electrical men, like Caesar's Gaul, may be divided into three classes—the technical, the commercial and the consumer, represented by the engineer, the seller and the buyer. Like the ancient Celtae, Aquitani-ani and Belgae, they speak in different languages, and from this fact there has arisen no little confusion. This is well exemplified in an excerpt reprinted elsewhere from the Oakdale Leader in which the engineer's terms are translated for the ordinary reader. While this bit of humor is somewhat overdrawn, it represents the clarity of the usual layman's views of the technical engineer's work.

As the commercial man takes a peculiar delight in scoffing at the engineer's difficulty in making himself understood, it may come as a matter of surprise that his own explanations are likewise often Greek to the consumer. This is particularly the case when the commercial man tries to explain why a consumer is charged a given rate for electric service. He becomes so involved in a maze of terms which he does not understand that he completely mires and occasionally antagonizes the man whom he is endeavoring to convert to his way of thinking.

Because the various rate fixing bodies in our cities and states have decided that every man is entitled to equal service at equal rates, the central station is frequently supplying current at less than actual cost to the small consumer. To explain this, it is necessary to start on the assumption that the rates must be sufficient to bring a reasonable return on the investment. Analyzing that investment we are at once confronted by those much-mooted questions of valuation, physical, going and franchise. There are usually as many different estimates of physical value as there are estimators. No definition of going value has yet received universal acceptance. Then there arises the questions of "maximum demand" and "readiness to serve," "single rate" and double rate." These expressions are now common in the transactions of all conventions of central station men and they are apparently as far from solution as when they were first broached. Consequently, there is now need for some Moses to lead us out of the wilderness of verbiage into which we have wandered.

If those men who are actually studying these problems are so completely at variance, how is it possible to expect the average citizen to be convinced of their reasonableness. Though he may be silenced, he does not understand or believe what is being told him, and the commercial man thus undermines the foundation of public confidence which central station men are trying to establish. It is about time that the commercial men realized this fact and prepared a straightforward explanation of their methods of charging, couched in such simple language that even the most obtuse cannot fail to understand.

PERSONALS.

C. L. Cory is at Los Angeles.

F. B. Crocker of the Crocker-Wheeler Company, is at Hollywood, Cal., for his health.

James Lyman, engineer at the Chicago office of the General Electric Company is in San Francisco this week.

C. O. G. Miller, president of the Pacific Lighting Company, spent several days at Pasadena during the past week.

E. P. Hilborn, who represents the Great Western Power Company at Sacramento, spent last Tuesday at San Francisco.

A. C. Sprout has returned to his San Francisco office from an electrical engineering investigation in Siskiyou County.

C. W. McKillip, manager of the Sacramento Electric, Gas & Railway Company, of Sacramento, was a San Francisco visitor last week.

Peter Decker, president of the Decker Electric Company, San Francisco, spent the past three weeks in Monterey county on a vacation trip.

L. B. Wickersham, general manager of the United Railways, Portland, Ore., has been appointed chief engineer of the company, reporting to the president.

George Lawrence has been appointed local manager of the Western Union Telegraph Company at Los Angeles, succeeding R. H. Miller, who was promoted.

John A. Britton, general manager of the Pacific Gas and Electric Company, has been attending the annual meeting of the Pacific Coast Gas Association at Los Angeles.

Frank H. Short has returned to Fresno from the Conservation Congress at St. Paul, where he made a notable address on the subject of conservation of water power.

E. P. Shannon has been appointed assistant to John F. Stevens, president of the Oregon Electric Railway, United Railways and the Oregon Trunk Railway, Portland, Ore.

R. C. Coyne of the Kellogg Switchboard & Supply Co., Chicago, took charge of the Wisconsin territory early in September; headquarters for the present being at Delavan.

D. R. Milford, superintendent of the Kilarc station of the Northern California Power Company, visited San Francisco this week, as did also C. Bartlett, the company's manager at Willows.

C. A. Coolidge, who was recently appointed general manager of the Oregon Electric Railway, Portland, Ore., has been appointed general manager of the United Railways, Portland, to succeed L. B. Wickersham.

A. L. Searles who has had charge of the development of the new Fort Wayne electric rock drill is visiting the company's San Francisco office and superintending the operation of the drill at the Pacific Coast Electrical Exposition.

William D. Ward of the Pelton Water Wheel Company's San Francisco office has returned from a stay of two months in Colorado and South Dakota with a contract in his pocket for the water wheel end of a $1,500,000 hydroelectric installation.

Henry M. Richards, chairman of the executive committee of the Washington Water Power Company, Spokane, Wash., and formerly president of the company, was presented with a silver loving cup recently by the employees of the company as a token of esteem.

G. R. Field, assistant to H. H. Sinclair, the general manager of the Great Western Power Company, has returned from an inspection of the power plant at Big Bend. It is expected that the dam will be completed this season, with a height of 85 feet above bedrock and a width of about 330 feet on the crest.

John V. O'Brien, who rose from a messenger boy to the position of manager of the San Francisco office of the Western Union Telegraph Company, and was recently appointed a special commercial agent, died September 19th at St. Francis Hospital, from typhoid fever. He is survived by his wife, Ella O'Brien. Many expressions of regret were heard from Mr. O'Brien's friends on the Pacific Coast. The funeral took place September 21 and the interment was at Holy Cross Cemetery.

C. H. Gaunt, general superintendent of the Western Union Telegraph Company's Pacific Division, recently abolished the positions of district superintendents at San Francisco, Los Angeles and Seattle. He is reorganizing the system under a "three column" organization, according to which there will be three heads of departments in each of the three districts. The three district commercial superintendents just appointed are A. H. May, with headquarters at San Francisco; E. Boening, Seattle, and Hugh McPhee, Los Angeles. The district traffic superintendents are H. J. Jeffs, San Francisco; George D. Hood, Seattle, and R. H. Miller, Los Angeles. The district superintendents of plant are yet to be appointed.

Electrical men attending the Pacific Coast Electrical Exposition during the past week included J. W. Ricketts, Sacramento Valley Power Co., Chico, Cal.; E. S. O'Brien, Exchequer Mining and Power Co., Merced, Cal.; J. R. Harcourt, contractor, San Diego, Cal.; G. Geo. Gunderson, H. W. Johns-Manville Co., Seattle, Wash.; J. P. Crown, Peninsula Electric Works, Redwood City, Cal.; H. J. Coffee, dealer and contractor, Sonora, Cal.; W. W. Ewing, West Side Electrical Works, Portland, Ore.; F. C. Hancke, La Grange Water Power Co., Modesto, Cal.; F. W. Mitchell, manager Pac. T. & T. Co., Sonora, Cal.; R. Van der Naillen, Oro Light and Power Co., Oroville, Cal.; W. R. Layne, Sebastopol, Cal.; C. R. Woodington, Dinuba Electric Works, Dinuba, Cal.; Mr. Ayres, of Ayres & Steventon, contractors, San Diego, Cal.

A CORRECTION.

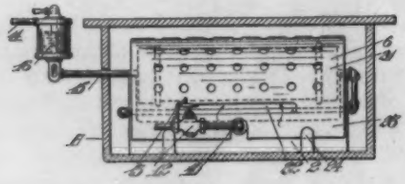
The article in the issue of July 23, 1910, entitled "Condensers for Small Stations," credited to Mr. Harry Remington, was written by Mr. Harry Pennington, the representative of the Wheeler Condenser & Engineering Co., of Carteret, N. J., at Houston, Texas.

THE LIGHT THAT FAILED.

Wednesday night the city was shrouded in darkness owing to the failure of the electric distributing plant to work properly. Enquiry of Mr. John F. Tulloch, the gentlemanly manager of the local plant, elicited the following information: The plant here is what is known as the two faced system. This method is operated by crossing the F rheostat with the lightning arrester abaft the forward exciter. Wednesday night the armature of the transformer short circuited with the brushes of the wattmeter causing the commulator to synchronise with the collector ring which closed one face of the voltmeter causing the currants to seek escape through the back door. This explanation Mr. Tulloch agrees to be the correct one and will be readily understood by the technical engineer, so as to enable the layman to understand the matter he says the essence of the juice in the ding hummer coallesced with the lead fuse which failed to vitrify properly, thus causing the current from two lines to run through one wire burning out a fuse in the substalation. The matter was been adjusted.—Oakdale (California) Leader.

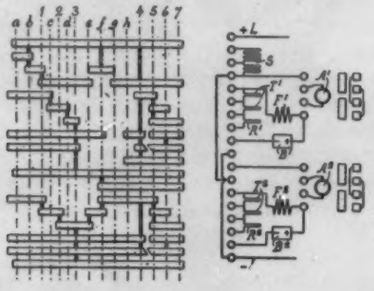
PATENTS

970,300. Oil-Burner. William H. Bradley, Half Moon Bay, Cal. The combination in an oil burner having a fuel nozzle, of a pan, a superposed horizontal cylinder, means to deliver fuel to the nozzle so that it may discharge transversely of the pan and beneath the cylinder, a perforated inclosure



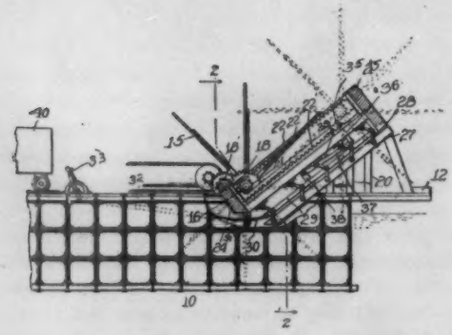
for the cylinder and products of combustion, said inclosure being outside of and spaced from the cylinder and adapted to retard the escape of the products of combustion, means to admit water to the cylinder, and a steam pipe leading from the cylinder and having jets discharging into the pan contiguous to said nozzle.

969,894. Method of and Means for Controlling Regenerative Electric Motors. Robert Lundell, New York. The method of operating a plurality of series motors arranged to drive a common load, which consists in connecting the motors to the line with each motor field in series with its armature,



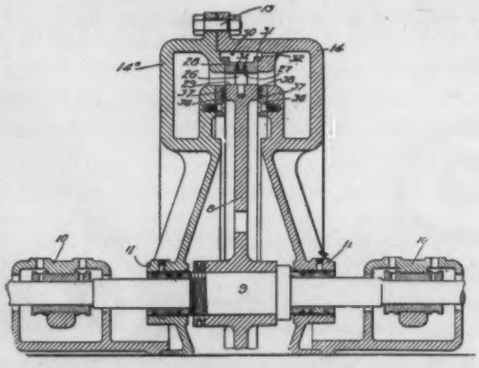
impressing independent and practically constant voltages upon the several field circuits and regulating the field excitation by varying the ohmic resistances of the said field circuits.

970,196. Hydraulic-Power Plant. James T. Dougine, Kenosha, Wis. The combination of a hull providing separated



floats and an intermediate passage, a water wheel in said passage, a shaft therefor, inclined tracks for the opposite ends of the said shaft, bearings for said shaft ends communicating with said tracks, pinions upon the shaft ends, rack members disposed for co-operation with the said pinions to cause the wheel in its rotation to elevate or lower itself upon the inclined tracks, and means for simultaneously shifting the rack members associated with the opposite pinions to cause either up or down movement of the shaft.

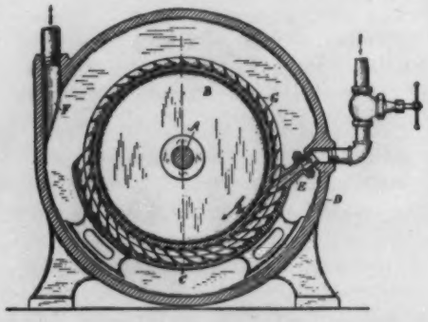
969,821. Re-entrant Turbine. George Westinghouse, Pittsburg, Pa. In an elastic fluid turbine, a rotor element provided with a row of shrouded blades, a casing surrounding said element, fluid discharge devices forming with said element, re-entrant stages extending circumferentially of said



turbine, yieldingly mounted packing strips located above and below the working faces of said blades for minimizing the escape of working fluid from stage to stage, and means for limiting the movement of said strips toward said element.

969,809. Alternating-Current Magnet. Arthur Simon, Milwaukee, Wis., assignor to The Cutler-Hammer Manufacturing Company, Milwaukee, Wis. In an alternating current magnet, in combination a plurality of coils for producing magnetic fluxes of different phase, means forming magnetic circuits or paths for said fluxes in the same plane, said paths being adapted to distribute the fluxes symmetrically about a common axis.

970,193. Turbine. Willis G. Dodd, San Francisco, Cal. A steam turbine comprising a rotating element and a stationary element, said elements between them forming an annular elliptical chamber, within which are located a series of guide vanes, constituting a series of tangential chambers,



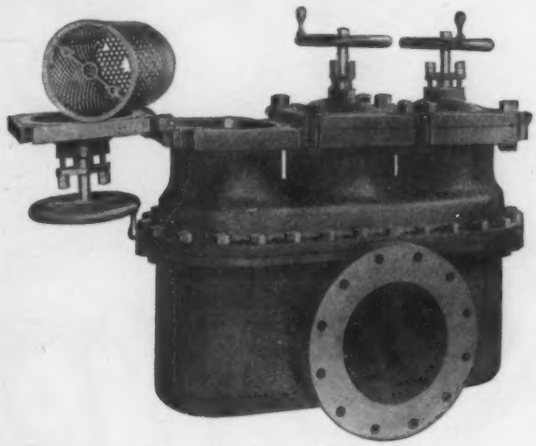
forming paths of constant deflection for the impelling medium, an expanding nozzle located within the first chamber of the series, a neutral axis or annular space between the stationary and rotating elements, formed by cutting away the guide vanes.

INDUSTRIAL

MULTIPLE STRAINERS.

Solid foreign matter in water such as ice, rocks, sticks, leaves, etc., has wrecked many pumps. It has stripped the blades from centrifugal pumps and put the valves of reciprocating pumps out of business many times and even when such solid matter has gotten past the pumps without doing severe damage it finds its way into surface condensers and boilers causing untold trouble.

Nearly all sources of water supply, especially for circulating water, contain an immense amount of suspended matter, and while attempts are often made to remove this by placing a strainer around the suction pipe foot valve, this only transfers the source of trouble. The strainer soon becomes clogged and it is necessary to shut off the pumps while it is being cleaned. If the water is being used for condensers this means the loss of the vacuum and throwing an extra load upon the power equipment of the plant and if there is no reserve power it means shutting down the plant.



Lagonda Multiple Strainer.

In order to get around these difficulties, the Lagonda Manufacturing Company of Springfield; Ohio, has recently perfected a multiple strainer for removing impurities in feed water, circulating water, etc. These strainers can be installed either outside, or inside of the buildings and in any position, horizontal, vertical or inclined. They also have the advantage that they are made up of different sections which can be cleaned, one at a time, without interrupting the flow of water.

The strainer consists of a cast-iron body having a number of removable strainer baskets, the number depending upon the size of the line. As these baskets can be easily removed for cleaning, without shutting down the pumps, the mesh is made very fine, they thus eliminate more foreign matter than any other type of strainer.

Water enters through an inlet pipe, passes up to the top of a valve chamber, where it divides, going down through all of the baskets in multiple. When it is desired to clean the strainer, one of the baskets is drawn to the upper part of the chamber by turning the hand-wheel, at the same time the valve collar is forced tightly against the valve seat and the valve disc on the bottom of the basket seats on the valve collar. This is all done automatically and entirely shuts off the water supply from the section containing the basket to be cleaned. By means of a small by-pass the pressure in this chamber is now relieved and the bolts at the top loosened and the flange cap tilted over exposing the basket. The basket can now be taken out and cleaned. In replacing the basket the operations are exactly the reverse. The next basket can now be removed in the same way and the whole strainer cleaned without shutting off the water. Should an obstruction rest upon the top valve collar, the basket when raised to cleaning position, will have a tendency to tilt the obstruction either into the basket or out of the way of the valve. This is due to the fact that the basket travels nearly its entire distance before the lower valve disc comes into contact with the lower seat of the valve collar.

The effective straining area of a Lagonda strainer is from 2¼ to 4 times the area of the pipe line and in removing one basket for cleaning the straining area is not reduced more than 30 per cent, thus the pipe line is never throttled in the process of cleaning. One important item concerning these strainers is that all of the internal parts subject to the action of water are made of bronze thus eliminating all troubles from corrosion. Neither are there any leather or rubber washers used.

Lagonda multiple strainers are built in sizes from 2 to 48 inches, having two to six baskets, the number depending upon the size of the strainer. They are also suitable for use in either suction or pressure lines and are built to stand working pressures up to 200 lbs. per sq. in. In practice one of the baskets is left out of service so that in case the baskets in use should become clogged the clean basket can be quickly lowered into service. Further details concerning the various uses for these multiple strainers can be had by addressing Chas. C. Moore & Co., Engineers, San Francisco.

SWITCHBOARD MATERIALS.

BY C. F. ADAMS.

The early history of electric lighting records little of interest to the student of switchboards. Then, electric instruments were generally mounted on some variety of hard wood, and the term "switchboard" was a correct descriptive title. Arc light machines were of ten and sixteen lamp capacity and the pioneer incandescent lamps were operated at from 50 to 70 volts. A 30 kw. dynamo was a large machine for those days. The insulation question, and the operating temperatures of the instruments and conductors was a matter of small concern. Instruments, switches, fuses and lighting arresters were all mounted on wood bases. Wood was found to be unstable, even when carefully varnished, warping from heat or moisture, and also, from some "unknown cause," the wood mountings were occasionally subject to fire.

The use of small slabs of slate for the mounting of fuses and plug switches was the first application of fire-proof material to instrument mounting. A larger slab, mounting several instruments was a natural development, these slabs being mounted on a skeleton wooden frame.

As lighting and power systems grew and the importance of continuous service was recognized, the question of fire risks was carefully studied. Wood was abandoned and the fire-proof switchboard was a reality.

The decorative element in polished marble or enameled slate was fully realized, and the careful matching of shade and grain was an art in itself. The monumental character of those structures served to impress the public mind, and added the element of Art to the field of the mysterious. In one Southern power house a colored "field hand" paid this tribute. "Boss, ef I knowed thet when I wus daid un gone, I cud hav one of them marbles fur a hed stun, I'd be willin' to quit libin t'morro."

For handling high potentials and heavy currents the oil switch was evolved, and the era of the oil switch wrought

disaster for the ornamental marble or slate structures. The back and edges of slabs were varnished or otherwise treated to resist the invasion of oil. A heavy "short," expelling oil in a flaming shower has damaged many a handsome slab. The crowded oil switch mounted in tiers on the back of a "fireproof" board has almost disappeared. These essential devices are now relegated to the concrete or asbestos wood cell for obvious reasons.

For purposes of insulation, the limits of quarried materials were soon reached. A hydroscopic material is affected by the atmosphere, and the marble slab was often boiled in paraffine to render it more stable as an insulator. Fine metallic veins were ever present and those would lead to current creepage and ultimate disaster. In case of fire these treated slabs burned like a piece of "fat wood."

The advance of the art called for a better material, a material of high permanent insulating quality, and at the same time fireproof, as regards combustion and capable of sustaining high heat without disintegration. A material mechanically strong and free from the breakage and defacing incident to stone. A material easily machined and permanent of form and structure. A material impervious to moisture or oil, and a surface capable of a pleasing finish. These are the desired qualities of the ideal switchboard material. No single natural product was available with such characteristics.

The persistent efforts of the chemist and the skilled manufacturer has solved a product that is being largely employed for switchboard work. It is known as J-M Ebony Asbestos Wood, composed of Asbestos fibre—and other insulating and water-proofing materials. Two years' observation of J-M Ebony Asbestos Wood in service shows no deterioration, either electrically or mechanically. It is employed for switchboard panels, high tension switch tops, air switch or fuse bases, for barriers, and other uses. The external finish given this material in service is generally a dead black varnish.

In a test of some 2-inch J-M Ebony Asbestos Wood switch tops for 60,000 volt switches, metal plates 2 in. by 4 in. were placed on the surface 6 inches apart and the voltage raised to 40,000 volts before there was any apparent surface leakage, nor would this voltage puncture these tops which were two inches thick, although marble would have failed at about 10,000 to 12,000 volts.

WESTINGHOUSE CO.'S EXHIBIT AT N. W. ELECTRIC LIGHT & POWER CONVENTION.

One of the attractive features of the recent convention of the N. W. Electric Light & Power Association, as held on board the steamer "Queen" on the waters of Puget Sound, was the exhibit of the Westinghouse Electric & Mfg. Co., as shown by the accompanying illustration. The space allotted was utilized to the greatest advantage, as shown.

The company had on display their new line of electrically heated apparatus, also the latest types of motors, and a complete line of Westinghouse wire-type tungsten lamps from

Westinghouse Co.'s Exhibit at N. W. Electric Light and Power Convention.

25 to 500 watt capacity were on exhibition and attracted considerable attention and favorable comment. The coziness of the exhibit appealed to everyone and during the evenings and at other times when there were no business meetings, it proved to be an attractive place for central station men to congregate and discuss apparatus.

NEW CATALOGUES.

"Condensers for Small Central Stations" is the title of a 24-page pamphlet published by the Wheeler Condenser & Engineering Company, of Carteret, N. J., in which is reprinted a lecture delivered before the Missouri Gas, Electric & Street Railway Association.

The 1910 catalogue of wiring devices manufactured by the Bryant Electric Co., and the Perkins Electric Switch Manufacturing Co. of Bridgeport, Conn., is being distributed to the trade. The "superior devices" listed and illustrated include adapters, cutouts, fuses, receptacles, rosettes, sockets and switches, there being a total of 1547 devices listed, 383 of which are here listed for the first time.

NEWS NOTES

FINANCIAL.

ASHLAND, ORE.—Bids will be received at the city recorder's office up to September 27th for the purchase of $25,000 electric light bonds.

VALLEJO, CAL.—Bonds to the amount of $40,000, the proceeds of the sale of which will be devoted to improvement of the municipal water system, have been voted at a special election.

ONTARIO, CAL.—The Trustees of the town of Ontario have postponed the special election on the bond proposition from September 16 to a date to be selected the latter part of the month. The bond issue was for $175,000 for a water system and other works. The reason given is that the ordinances and notices had been signed by the temporary president of the board instead of by the regularly elected chairman.

SAN FRANCISCO, CAL.—Plans have been made by the Public Utilities Committee of the Board of Supervisors for active prosecution of the work on the city water project in the Lake Eleanor district. A recommendation was adopted that $3,000,000 worth of the Hetch-Hetchy bonds be offered for sale. The first $1,000,000 to be sold next February, the second $1,000,000 the following August and the third $1,000,000 in August of 1912. It was also recommended that the Finance Committee transfer $10,000 from the Emergency Fund for the immediate use of the engineer's department, to prosecute the work necessary in and about Lake Eleanor valley. Of the first $1,000,000 worth of bonds sold $600,000 will be necessary for the purchase of the remainder of the William Hammond Hall properties, on which the city has an option for one year, of which over six months has already passed. Another $50,000 will be needed to carry on the work made necessary by Secretary of the Interior Ballinger in ordering an investigation of all the available water systems within reach of San Francisco.

INCORPORATIONS.

ELMA, WASH.—The Elma Telephone Company has been incorporated for $10,000 by C. H. and S. L. Palmer.

PE ELL, WASH.—The Central Power Company has been incorporated for $15,000 by L. A. Webb and Phil S. Locks.

WHITTIER, CAL.—A portion of the Rancho Potrero Grande tract consisting of about 200 acres of land has been sold. The property is a part of the La Merced grant and belonged to the Lucky Baldwin estate. A water company has been organized under the name of the Potrero Water Company and will begin to develop for water as soon as they get a charter. Officers of the company are: President, A. F. Taylor of Glendora, Cal.; Vice-President, A. H. Cheney of Los Angeles; Secretary, B. F. Arnold of Whittier, Cal.

GIFFORD, IDAHO.—The town of Gifford will soon have a water system for domestic and irrigation purposes. Residents of the town and surrounding neighbors have subscribed for stock in the Gifford Water Supply Co., limited, articles of incorporation of which have been filed with the county auditor and recorder, with capital stock of $10,000. The company is incorporated for the purpose of constructing and operating a plant for pumping water, to build reservoirs and put in tanks for installing water to be used under pressure, to lay water mains and pipes and put in hydrants and to supply water for domestic, irrigation and fire purposes. It is the purpose to begin the installation of the plant at once.

TRANSMISSION.

EUGENE, ORE.—The Northwestern Corporation has been granted a franchise to use the Lane County roads for its power line from Springfield to Albany.

ALBANY, ORE.—The county court has granted a franchise to theTri-State Railway & Power Company for an electric power line from Eugene to this place.

TACOMA, WASH.—Count Kokudava and two other wealthy Japanese arrived last week from the East, where they purchased machinery for a $100,000 electrical plant to be installed at Kyoto.

GRANGEVILLE, MONT.—The Grangeville Light & Power Company is engaged in making extensive improvements here by enlarging the power station, reconstruction of the power line and construction of a modern building.

SPOKANE, WASH.—H. E. Shallenberger, head of the International Lead & Iron Company, has announced that a town is being laid out at Salmon Rapids and preliminary surveys have been made for the installation of a 65,000 horsepower electric plant on the Salmon river.

SAN BERNARDINO, CAL.—The Board of Supervisors will receive sealed bids up to 2 p. m., October 10th, for a certain franchise applied for by the Pacific Light & Power Company, for the right to erect and construct and for a period of 40 years to maintain and operate poles and other superstructures, for the transmission of electricity and to lay, maintain and operate wires, cables and other appliances for transmitting and conducting electricity upon the highways of this county.

TRANSPORTATION.

WOODLAND, CAL.—The construction of the Vallejo & Northern Railway has commenced in the breaking of ground on Second street in this city.

BANDON, ORE.—J. H. Somers, representing the Coos Bay Traction Corporation, is here with the proposition of raising $50,000 for the construction of an electric railway from Coos county to Grants Pass and Roseburg.

MEDFORD, ORE.—John R. Allen, of the Southern Oregon Railroad & Electric Company, states that construction work on the proposed electric interurban railway to connect Medford, Ashland and Grants Pass will start scon.

LOGAN, IDAHO.—The County Commissioners have granted the amended franchise for the operation of an interurban electric railroad to Lee Neilsen and his associates. The route is from Wellsville to Hyrum, thence along the east edge of the valley to Logan, touching the towns of Millville and Providence. From Logan the line goes through Greenville to the Idaho State line, passing through Hyde Park.

MARTINEZ, CAL.—The Robert Dollar Company has delivered 60,000 ties at Bay Point for the Oakland and Antioch Railway and three carloads of rails were laid down at that point on the same day. The engineering crew of the Oakland and Antioch Railway is at present in Martinez finishing the surveying work for the road and the laying of rails and ties will be started this week. The coaches for the road have also been ordered and will be delivered about November 1.

SAN FRANCISCO, CAL.—Steps have been taken by the Public Utilities Committee of the Board of Supervisors to

push forward the construction of the Geary street railroad. A formal resolution has been adopted recommending that the Board of Public Works be authorized to enter into contracts for the purchase of rails to the maximum amount of $130,000, and a second resolution provided for the appropriation of $5000 for the expense of formulating definite plans for beginning the work.

SAN FRANCISCO, CAL.—Notice is given that the annual meeting of the stockholders of the Northern Electric Railway Company, a corporation, will be held at the office of the company, room No. 1101, in the Alaska Commercial Building, situated on the northeast corner of California and Sansome streets, in the city and county of San Francisco, State of California, on Monday, the 26th day of September, A. D. 1910, at he hour of 2:00 o'clock p. m., of that day, for the election of directors for the ensuing year, and for the transaction of such other business as may come before the said meeting.

SAN FRANCISCO, CAL.—The franchise for the proposed extension of the Parnassus avenue car line from the Affiliated Colleges out to Ninth avenue and up Ninth avenue to Pacheco street, for which the residents of the Sunset District have been working for two years, and towards which they subscribed $20,000, is almost assured. The bid of Thos. W. Watson, representing the residents of the Sunset District has been approved by the Public Utilities Committee and a resolution passed recommending its sale to Watson. The line for which the franchise is asked, while only about a mile in length, will tap a considerable district in the Sunset and will open up for settlement some of the most desirable land for homeseekers in the city. It is thought that the line will be completed by next year.

ILLUMINATION.

PRINCE RUPERT, B. C.—The Tsimpsean Power Company will erect a gas plant here. John Cotes of London has the contract.

MARTINEZ, CAL.—The Richmond Light & Power Corporation bid for an electric franchise over the streets in this county, has been accepted by the Board of Supervisors.

STEWART, B. C.—The Portland Canal, Light, Water & Power Company, in this district, proposes to build a plant on American creek and will spend about $100,000 in the undertaking.

SPOKANE, WASH.—Work will proceed immediately by the Washington Water Power Company to deepen and straighten the channel of the Spokane river for 1500 feet below the Monroe street bridge.

ONTARIO, CAL.—The Ontario-Upland Gas Company plans improvements to the extent of over $2500. It will install a gas booster which will raise the pressure in the tanks at the noon hour, when the consumption is the heaviest.

WAILUKU, H. T.—When the Wailuku Electric Company first received its charter it was intended to install a large plant suitable for light and power. The company is now going ahead on a lighting plant only. It is intended to install a 1000-light plant.

UPLAND, CAL.—An ordinance has been passed granting a franchise to the Pacific Light & Power Company to erect poles and string wires along Orange avenue in this city and to connect with the Tenth street line. A power house will probably be erected on Orange avenue by the company.

EUGENE, ORE.—An announcement has been made by Chief Engineer White that arrangements are being made for building a holder for the new water plant to have a capacity of 150,000 cubic feet. He also states that an entirely new water gas plant will be installed at once consisting of two "sets" of a capacity of 250,000 cubic feet each per day.

TELEPHONE AND TELEGRAPH.

WATERVILLE, WASH.—A franchise was granted the Farmers' Telephone Company for a system in this city.

ASHLAND, ORE.—The City Council has voted to cancel the franchise secured by E. C. Sharp on account of failure to begin work.

GREAT FALLS, MONT.—The Great Falls Automatic Telephone Company will install a private branch telephone exchange in the $400,000 Rainbow hotel, nearing completion.

MISSOULA, MONT.—The Rocky Mountain Bell Telephone Company is engaged in repairing the burned telephone lines between here and Wallace, Idaho; 40,000 ft. copper wire and 800 poles were wiped out.

PENDLETON, ORE.—The Pacific Telephone & Telegraph Company is engaged in constructing a long distance telephone line between Walla Walla and this place. An expenditure of $20,000 will be made to improve the service of this city.

SAN FRANCISCO, CAL.—The Alaska Steamship Company has contracted with the United Wireless Telegraph Company for the equipment of their steamship La Touche with a one-kilowatt plant. The installation on this boat is now being rushed and it is expected will be completed in the course of a day or two. The Alaska Steamship Company at the present time has the following ships equipped with this system: Victoria, Northwestern, Dolphin, Seward, Olympia and Jefferson. The steamship Yucatan of this same line was equipped with the system at the time of the disaster. Valuable service was rendered by the use of the wireless on this ship.

WATERWORKS.

LINDSAY, CAL.—Authority is granted to W. S. Howe and assigns to lay water pipes in the streets and alleys of certain additions to this town.

LEWISTON, IDAHO.—The Council will install an additional pump at the water plant to cost approximately $2500, which will be installed the coming year.

TACOMA, WASH.—The Council has passed an ordinance granting to the Tacoma Water Supply Company a permit to lay and maintain water pipes in certain streets in the city of Tacoma.

TACOMA, WASH.—Tre International Contract Company of Seattle will probably receive the contract for building the intake and headworks of the Green River gravity water plant. The engineer's estimate on the work is $70,000.

GLENDORA, CAL.—At a meeting of directors of the Citrus Belt Water Co., it was decided to sink the present well deeper, replace the board curbing with curbing and install a new pump. The estimated cost of improvements is $10,000.

HOQUIAM, WASH.—At the next meeting of the Council a franchise will be presented providing for a 25-year franchise to lay and maintain water mains and pipes in Histler's Addition to Aberdeen. The application has been made by Rudolph Histler.

SAN FRANCISCO, CAL.—Permission has been granted to the Ames-Harris-Neville Company to lay steam pipe and return underground across Potrero avenue at the crossing of Alameda street, from the building of the Stauffer Chemical Company, to a certain building, the property of Mr. Ames.

WOODLAND, CAL.—D. B. Ridby of the Oakland Iron Works appeared before the Trustees at its last meeting with a blue print of plans for an auxiliary waterworks plant. The members of the board approved the plans but no further action was taken, as the site for the plant will not be located until the results of the boring tests for water are known.